Photographed by Ernest Edwards, 20 Baker Street W
Printed in Pigments. (Swan's Patent.)

# BIOGRAPHICAL SKETCH

OF

# HUGH FALCONER, A.M., M.D.

VICE-PRESIDENT OF THE ROYAL SOCIETY;

FOREIGN SECRETARY OF THE GEOLOGICAL SOCIETY;

AND FOR MANY YEARS

SUPERINTENDENT OF THE H. E. I. COMPANY'S BOTANICAL GARDENS

AT SUHARUNPOOR AND CALCUTTA.

BY

CHARLES MURCHISON, M.D., F.R.S.

---

[*REPRINTED FROM DR. FALCONER'S 'PALÆONTOLOGICAL MEMOIRS, THE PAGES OF WHICH ARE REFERRED TO IN THE FOOTNOTES.*]

---

LONDON:

1868.

LONDON: PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
AND PARLIAMENT STREET

# BIOGRAPHICAL SKETCH.

ON the 29th of February, 1808, HUGH FALCONER was born at Forres, in the North of Scotland—a town beautifully situated on the banks of the Findhorn, but best known from its traditional connection with the 'blasted heath' of Macbeth. He was the youngest of a family of five sons and two daughters, his father, Mr. David Falconer, being a descendant of an ancient family, the Falconers of Lethen and Halkerton. He received his early education at the Grammar School of Forres, where he attracted the notice of his teachers from his wonderful memory and facility for acquiring languages; and then, aided by the resources of an elder brother in India, he entered the University of King's College, Aberdeen, to pass through the established Scotch Academical curriculum of classical literature and science, extending over a period of four years. A fellow student, who was very intimate with him at that time, remembers well his diligence and steady conduct, and adds that even then, 'he was an immense favourite with his classfellows, and was remarked for his playful genial humour, and frank, generous, winning disposition,' and that 'they who watched him closely could detect in the young student the penetrating intellect and shrewdness in observing which distinguished the future palæontologist.' [1] Reading was always his favourite amusement, and although the subjects which he studied were very varied, he was especially fond of everything relating to Natural History. A book entitled 'The Three Hundred Animals' was an especial favourite,

[1] Letter from the Rev. Duncan Campbell.

and the intervals of his sessions at King's College, when he was a pupil of Drs. Smith and Adams of Forres, were chiefly spent in studying the botany of the neighbourhood and in watching the habits of the many animals which he kept as pets. After receiving the degree of Master of Arts at Aberdeen, in 1826, he proceeded to Edinburgh to enter on the study of Medicine. Here he eagerly followed up his early tastes for Natural History, under the systematic tuition of the late Professor Graham in Botany, and Professor Jameson in Geology and the other branches of Natural History. According to the testimony of one who knew him well, 'he laboured with untiring energy. Shut up in his apartments for days together, he allowed himself little relaxation except that of accompanying the great Wernerian Professor in his Geological excursions with wallet and hammer, which he never failed to do.'[1] His range of study, however, at this time was perhaps too excursive for solid attainment in any one walk; for, besides attendance on the numerous classes in Medicine and Natural History, he matriculated as a student in Divinity, in order to benefit by the renowned teaching of Dr. Chalmers, then Professor of Divinity in the University. In 1829 he received the degree of M.D. from the Edinburgh University, his graduation thesis being entitled 'De Chorea.'

In the same year he was nominated to the appointment of Assistant-Surgeon on the Bengal establishment of the Hon. East India Company, but not having attained the required age of 22 years, he proceeded to London, where he devoted the necessary interval to assisting the late Dr. Nathaniel Wallich in the distribution of his great Indian Herbarium; and, under the generously bestowed instruction of Mr. Lonsdale, to the further study of Geology and Palæontology. The Museum of the Geological Society of London, under the charge of Mr. Lonsdale, gave him access to the collection of Indian fossil mammalia from the banks of the Irrawaddi, formed by Mr. John Crawfurd during his mission to Ava. The description of these remains by Mr. Clift had excited much interest in the scientific world, as the first instance in which ground had been broken in the palæontology of tropical regions.

[1] The Rev. D. Campbell.

In 1830 Dr. Falconer proceeded to India as an Assistant-Surgeon in the Hon. East India Company's service, and arrived in Calcutta in September of the same year. Here he at once undertook an examination of fossil bones from Ava, in the possession of the Asiatic Society of Bengal, and published a description of them in the third volume of the 'Gleanings in Science,' an Indian journal then conducted by Mr. James Prinsep. This notice[1] was slight and modest in its scope; but the cultivators of Science in India were then few in number, and its appearance at once gave Falconer a recognized position in their roll.

Early in 1831 Dr. Falconer was ordered to the army station at Meerut, in the North-Western provinces. His first and last military duty, during twenty-six years of service, was to take charge of a detachment of invalids proceeding from Meerut to the sanitarium of Landour, in the Himalayahs. This led him to pass through Suharunpoor in April 1831, where the late Dr. Royle was then superintendent of the Botanic Garden. Kindred tastes and common pursuits soon knit Falconer and Royle together; and, at the instance of his friend, Falconer was speedily appointed to officiate for him during leave of absence, and, on Royle's departure for Europe, in 1832, to succeed him in charge of the Botanic Garden. Thus, at the early age of twenty-three, did he find himself advanced to a responsible and independent public post, offering to a naturalist the most enviable opportunities for research; so fertile was the Indian service then in chances to rise for any young officer who chose to make the exertion.

Suharunpoor is situated in lat. 29° 58′ N. and long. 77° 30′ E., between the Jumna and Ganges rivers, outside the belt of Terai forest, which lies between the mountains and the plains, and is distant about twenty-five miles from the Sewalik Hills, beyond which rise the Himalayahs. It is thus most favourably situated as a central station for Natural History investigations; the rivers, plains, forests, and hills teeming with life in every shape, and the range of elevation combining, within a short distance, the features and productions of tropical temperature and alpine regions insensibly

[1] See p. 412 of this volume.

blended. Being a remote provincial station, with at that time only half-a-dozen European families, the white man had to draw on local means in all emergencies where the appliances of civilized life were required; but the intelligence, docility, and exquisite manual dexterity of the natives, backed by their faith in the guiding head of the European, furnished an inexhaustible fund of resource. To construct, for example, a barometer for mountain explorations, broken tumblers were melted and blown into a tube; mercury was distilled from cinnabar purchased in the bazaar; a reservoir was turned out of box-wood felled in the mountains; and finally a brass scale was cast, shaped, and even graduated, by a native blacksmith, under the superintending eye of the amateur. Or again, he might be seen superintending the expression of some indigenous oil as a substitute for salad oil, when the European supply had been exhausted. Such discipline was of infinite value in training the young officer to habits of self-reliance and to kindly relations with those among whom his lot was cast, and no doubt contributed to that great fund of universal information for which Falconer was afterwards so remarkable.

In 1831 Dr. Falconer commenced his field explorations, by investigating the geological formation of the Sewalik Hills. Captain Herbert, in his mineralogical survey of the N. W. Himalayahs, had referred the Sub-Himalayahs to the age of the 'New Red Sandstone;' but Dr. Falconer, on his first visit, from finding beds of incoherent gravel covering the northern slope of the range, from the occurrence of seams of lignite and dicotyledonous woods discovered by Lieutenant Cautley in 1827, and from the mineral characters of the different strata, inferred that they were of a tertiary age, and analogous to the *Molasse* of Switzerland.[1] Thirty years of subsequent research by other geologists have not altered that determination, although our exact knowledge of the formation has been greatly extended. Early in 1834 Dr. Falconer gave a brief account of the Sewalik Hills, describing their physical features and geological structure, with the first published section showing their relation to the Himalayahs.[2] The name 'Sewalik' had been vaguely applied

[1] Journal Asiatic Society of Bengal, March 1832, vol. i. p. 96; and letter to the late Professor Jameson of Edinburgh University, February 8, 1836.

[2] Ib., vol. iii. p. 182.

before then by Rennell and others to the outer ridges of the true Himalayahs, and the lower elevations towards the plains. Dr. Falconer restricted the term definitely to the flanking tertiary range, which is commonly separated from the Himalayahs by valleys or *Dhoons*. The proposed name was not favourably received at the time by geographical authorities in India; but it is now universally adopted in geography and geology, as a convenient and well-founded designation.

When, in 1831, Dr. Falconer determined the tertiary age of the Sewalik Hills, the confirmatory evidence of animal remains was wanting; but he was led to the conclusion 'that the remains of Mastodon and other large extinct mammalia would be found either in the gravel or in other deposits occupying the same position in some part of the range, and the notice in Ferishta's Indian History of the bones of giants being found in the hills in which the Sutlej took its origin made this opinion the more probable.'[1] Still other geologists, including Govan, Herbert, and a sharp-eyed observer like Jacquemont, had previously gone over the ground, but had failed to detect any fossil remains. Towards the end of 1831, Dr. Falconer, from the indication of a 'black cylindrical fossil,' found some years before by his friend and colleague Capt. (now Sir Proby T.) Cautley, but the real nature of which had been previously overlooked, was led to discover bones of crocodiles, tortoises, and other fossil remains in the tertiary strata of the Sewalik Hills. A brief notice of this important discovery, extracted from a letter by Dr. Falconer, appeared in the 'Journal of the Asiatic Society' for March 1832.[2] In April 1834, Dr. Falconer discovered the shell of a fossil Tortoise in the Timli Pass, and immediately after the search was followed up with characteristic energy by Capt. Cautley in the Kalowala Pass by means of blasting, and resulted in the discovery of more perfect remains, including Miocene mammalian genera. The finding, therefore, of the fossil fauna of the Sewalik Hills was not fortuitous, but a result led up to by researches suggested by previous special study, and followed out with a definite aim.

The researches thus begun were followed, about the end of 1834, by the discovery by Lieutenants Baker and Durand of

[1] Letter to Professor Jameson.

[2] Op. cit. vol. i. pp. 96 and 249, and letter to Professor Jameson, already referred to.

the great ossiferous deposit of the Sewaliks, near the Valley of Murkunda, and below Nahun. Lieut. Baker's attention had been directed to this by his having been presented by the Nahun Rajah with a fragment of tusk and the fossil tooth of an Elephant,[1] which had been picked up at Sumroti, near the Valley of Pinjore, and which the Rajah regarded as the remains of giants destroyed by the redoubtable Ramchundra. Capt. Cautley and Dr. Falconer were immediately in the new field. Falconer's enthusiasm may be judged of from the following extract of a letter to Mr. Prinsep :—

'You have heard from Capt. Cautley and Lieut. Baker about the late fossil discovery up here. I have come in for a lion's share of them. In one of my tours I had to return by Nahun, and having heard of the tooth presented by the Rajah, in October, to Lieut. Baker, I made inquiry, and had a fragment of tooth presented to me also. I got a hint of where they came from, and on going to the ground, I reaped a splendid harvest. Only conceive my good fortune. Within six hours I got upwards of 300 specimens of fossil bones ! This was on November 20th, a couple of days after Lieuts. Baker and Durand had got their first specimens through their native collectors.'[2]

Similar remains were subsequently discovered by Dr. Falconer in the Sewalik range eastward of the Ganges, near Hurdwar.[3] By the joint labours of Cautley, Falconer, Baker, and Durand, a sub-tropical mammalian fossil fauna was brought to light, unexampled for richness and extent in any other region then known. It included the earliest discovered fossil *Quadrumana*, an extraordinary number of *Proboscidea* belonging to *Mastodon*, *Stegodon*, *Loxodon*, and *Euelephas*; several extinct species of *Rhinoceros*; *Chalicotherium*; two new subgenera of *Hippopotamus*, viz. *Hexaprotodon* and *Merycopotamus*; several species of *Sus* and *Hippohyus*, and of *Equus* and *Hippotherium*; the colossal ruminant *Sivatherium*, together with fossil species of *Camel*, *Giraffe*, *Cervus*, *Antilope*, *Capra*, and new types of *Bovidæ*; *Carnivora* belonging to the new genera *Hyænarctos* and *Enhydriodon*, and also to *Drepanodon*, *Felis*, *Hyæna*, *Canis*, *Gulo*, *Lutra*, &c; among the *Aves*, species of *Ostrich*, *Cranes*, &c.; among the *Reptilia*, *Monitors*,

[1] This tooth was described and figured by Lieut. Baker in the Journ. As. Soc. of Bengal for December, 1862, and was subsequently determined by Dr. Falconer to belong to *Elephas Ganesa*.

[2] Journ. As. Soc., vol iv. p. 57.

[3] 'Note on the Occurrence of Fossil Bones in the Sewalik Range, eastward of Hurdwar.'—Journ. As. Soc. of Bengal, vol. vi. p. 233, 1837.

and *Crocodiles*, of living and extinct species, the enormous Tortoise, *Colossochelys Atlas*, with numerous species of *Emys* and *Trionyx*; and among fossil Fish, *Cyprinidæ* and *Siluridæ*. The general facies of the extinct fauna exhibited a congregation of forms participating in European, African, and Asiatic types. Of the mammalian remains all belonged to extinct species, but of the *Reptilia* and Freshwater Shells, some of the fossil species were identical with species now in existence on the continent of India; and from this fact, more than thirty years ago, Dr. Falconer was led to draw important inferences as to the antiquity of the human race.

Thrown suddenly upon such rich materials, the ordinary means resorted to by men of science for determining them by comparison were wanting. Of palæontological works or osteological collections in that remote quarter of India there were none. But Falconer was not the man to be baffled by such discouragements. He appealed to the living forms abounding in the surrounding forests, rivers, and swamps to supply the want. Skeletons of all kinds were prepared; the extinct forms were compared with their nearest living analogues, and a series of memoirs by Dr. Falconer and Captain Cautley, descriptive of the most remarkable of the newly discovered forms, appeared in the 'Asiatic Researches,' the 'Journal of the Asiatic Society of Bengal,' and in the 'Geological Transactions.' The Sewalik explorations soon attracted notice in Europe, and in 1837 the Wollaston Medal, in duplicate, was awarded for their discoveries to Dr. Falconer and Capt. Cautley by the Geological Society, the fountain of geological honours in England; while the value of the distinction was enhanced by the terms in which the president, Mr. (now Sir Charles) Lyell was pleased to announce the award.

'When,' remarked the President, 'Capt. Cautley and Dr. Falconer first discovered these remarkable remains, their curiosity was awakened, and they felt convinced of their great scientific value; but they were not versed in fossil osteology, and, being stationed on the remote confines of our Indian possessions, they were far distant from any living authorities or books on Comparative Anatomy to which they could refer. The manner in which they overcame these disadvantages, and the enthusiasm with which they continued for years to prosecute their researches, when thus isolated from the scientific world, are truly

admirable. Dr. Royle has permitted me to read a part of their correspondence with him, when they were exploring the Sewalik mountains, and I can bear witness to their extraordinary energy and perseverance. From time to time they earnestly requested that Cuvier's works on Osteology might be sent out to them, and expressed their disappointment when, from various accidents, these volumes failed to arrive. The delay, perhaps, was fortunate; for, being thrown entirely upon their own resources, they soon found a Museum of Comparative Anatomy in the surrounding plains, hills, and jungles, where they slew the wild tigers, buffaloes, antelopes, and other Indian quadrupeds, of which they preserved the skeletons, besides obtaining specimens of all the reptiles which inhabited that region. They were compelled to see and think for themselves, while comparing and discriminating the different recent and fossil bones and reasoning on the laws of comparative osteology, till at length they were fully prepared to appreciate the lessons which they were taught by the works of Cuvier.'[1]

These Sewalik researches, interrupted for a time by distant employment on other duties, were subsequently resumed by Dr. Falconer in England.

Concurrently with these investigations, Dr. Falconer's official duties, as Superintendent of the Suharunpoor Botanic Garden, led him to explorations in the snowy range of the neighbouring Himalayahs.

In 1834 a Commission was appointed by the Bengal Government to inquire into and report on the fitness of India for the growth of the tea-plant of China. Acting on the information and advice supplied by Dr. Falconer,[2] the Commission recommended a trial. The Government adopted the recommendation; the plants were imported from China, and the experimental researches were placed under Falconer's superintendence in sites selected by him. Tea culture has since then greatly extended in India, and the tea of Bengal bids fair to become an important commercial export from India, as Falconer long ago predicted.

In one of his expeditions, in July and August 1834, in search of sites for tea-plantations, Dr. Falconer succeeded in

[1] Address at anniversary meeting of Geol. Soc. February 17, 1837; ib. vol. vi. p. 890.

[2] On the Aptitude of the Himalayahs for the Culture of the Tea Plant.—Journ. As. Soc. of Bengal, 1834, vol. iii. p. 182. The following is an extract from a letter from Dr. Falconer to Sir Proby Cautley, dated May 2, 1844: 'My tea services are undeniable. The experiment was attempted on my recommendation, and conducted under me; the first tea was manufactured under me, and the produce declared by three sets of brokers to be equal to the best China tea.'

ascending the Jumnootree as far as the hot springs at the sources of the Jumna. His diary kept during this journey is full of interest. He dwelt with much force on the singular contrast to the Alps of Switzerland, or the Highlands of Scotland, presented by the Himalayahs in the absence of lakes,[1]—a fact which many years afterwards he handled with his wonted vigour in the discussion upon the Glacier-Erosion theory of lake-basins. Between Mussooree and Deobun he discovered *greenstone trap*. He also described a section of the bed of the Jumna at Burkot, which he believed to possess great interest in connection with the Sewalik Hill formation. It consisted of schistose primitive rocks with a superimposed layer of unstratified gravel, forming a cliff upwards of 50 feet above the level of the river, and exactly like that found in the Kheeri and Kalowala passes. It appeared to Dr. Falconer that this was due to 'a diluvial action higher up the valley, perhaps the sudden disruption of a large volume of water, forming a mighty wave which swept along suspended in it an enormous quantity of gravel and left it deposited as at Burkot, at intervals in its course, where the velocity of the stream might have diminished, and which rushed on to the plains, where, disemboguing from its contracted channel, it spread out and left the gravel deposit now crowning the Sewalik Hill formation, previous to their upheaval.'

A letter written to the Rev. Dr. Gordon of Birnie, N.B., soon after his return from the Jumnootree, contains the following paragraph:—

'The rock formations of the Himalayahs are all primary: the Sub-Himalayan is very recent. In the outer ridges you get limestone and the newer primary rocks (transition). As you go on, gneiss, mica-slate, &c. succeed. In the outer ridges the volcanic rocks are greenstone traps (I believe I was the first to make this out), often with porphyritic crystals, and here and there unstratified quartz rock. As you go inwards you get granite and syenite. On the southern side of the snow peaks there are more recent formations, and I should not have said that the Himalayahs are *entirely* primary. You there get limestone with *Ammonites*, *Orthocerates*, *Trilobites*, and *Terebratulæ*, as in the mountain limestone of England. The snowy range or central ridge has an

[1] 'Lakes are scarcely anywhere seen in the Himalayahs. This singular feature strikes any one who has seen the Highlands of Scotland or travelled in the Alps,' &c.

elevation varying from 15,000 to 26,000 feet. Perhaps the mean height may be from 18,500 to 19,000. The snowy mountains are not, as in the *Andes*, interrupted peaks here and there of porphyries and other traps, but a continuous line of ridges, and the highest of them are certainly primary schists, such as gneiss, &c. You may remember, perhaps, Jameson's doubts about this point. But I am convinced that they are only huge masses of the same formation as the lower ridges, upheaved to a greater elevation. The scenery is magnificent; like Byron's ocean, "Endless, boundless, and sublime"; huge, vast, and awe-striking. To give you an idea of some of the views: I got up on the top of a high mountain called Choor, half way between the snowy range and the plains, with an elevation of about 13,000 feet. In front, looking to the north, the eye took in a continuous line of snowy ridges, varying from 15,000 to 24,000 feet, or no less than 90° on a quadrant of the horizon. This is no exaggeration. Between me and them stretched an ocean of mountain waves, I overtopping all. In the rear, or south, stretched another sea of mountain-ridges, with the plains of India in the distance, level as a lake, traversed here and there by a streak of silver marking the tiny show made by the mighty rivers Jumna and Ganges, and then turning to right and left was a stretch of ridge upon ridge and of mountain upon mountain, bounded only by the limits of vision. I stood upon pinnacled masses of granite, which made a noble and harmonious offset to the whole. Follow me on another occasion to the source of the river Jumna, at the foot of the mountain Jumnootree, 21,000 feet high, I walking in the bed of the river, in a narrow winding channel, cutting off the view in every direction, with a lofty wall of rock on either hand. Imagine now a sudden bend of the channel opening a vista in front, and the mountain bursting on the view rising nearly two miles in height right over me, its black front patched over and its summit crested with snow, looking like an enormous wave curling with foam and rolling on to overwhelm us. So vivid was this impression, that astounded awe was the first feeling, and it required an exertion of reason to get over it.'

In this and other expeditions, as well as by means of trained native collectors dispatched in different directions as far as Cashmeer and the borders of Chinese Tartary, Dr. Falconer made large additions to Indian Botany, which have been freely acknowledged by Dr. Royle and other botanical writers. Dr. Royle[1] states that Falconer's 'untiring zeal induced him to travel much in the midst of the rainy season,

[1] Illustrations of Botany of the Himalayahs, vol. i. 1839, pp. 362, 367. A new genus of the family of *Antidesmeæ* was designated by Dr. Royle, *Falconeria*, in honour of his friend Dr. Falconer, 'who is as zealous and able a botanist as he has shown himself to be a distinguished zoologist.'—Ib., p. 354.

to the great risk not only of his health, but of his life,' and from Falconer's diary it appears that during his trip to Jumnootree he was so seriously ill that on two occasions he thought it necessary to bleed himself to a large amount.

Not content with investigating the Natural History productions of the country surrounding Suharunpoor, Dr. Falconer had repeatedly expressed a desire to visit Cashmeer for the same object. Accordingly in June 1837, on the occasion of Burnes's second mission to Caubul, which preceded the Afghan war, Dr. Falconer, along with Lieutenant Mackeson, was ordered by Lord Auckland, on the recommendation of Captain Wade and Dr. N. Wallich, to join the party, and then proceed into Cashmeer and the countries north of that valley. United at Peshawur, the party consisted of Burnes, Mackeson, Leech, Lord, Wood, and Falconer. Of these six officers, Wood, the explorer of the Oxus, alone survives. In his journey from Loodianah to Peshawur, Dr. Falconer found the Sewalik fossils all along the Sub-Himalayan range from Jhelum on to Rawul Pindee. After exploring the neighbourhood of Peshawur he detached himself from the rest of the party and proceeded westward to Kohat and the lower part of the Valley of Bunguish, in order to examine the Trans-Indus portion of the Salt-Range, and then, in company with Lieutenant Mackeson, who many years later was cruelly assassinated by a fanatic at Peshawur, he made for Cashmeer, reaching the town of Cashmeer at the latter end of September. Soon after their arrival Lieutenant Mackeson received instructions to return at once to Peshawur, but Dr. Falconer remained at Cashmeer, where he passed the winter and spring examining the natural history of the valley and making extensive collections. He lived in the same house which had formerly been occupied by the celebrated traveller, Moorcroft, and here, for many weeks in December and January, he suffered from an alarming illness, which reduced him to a state of extreme prostration. The following summer (1838) he crossed the mountains to Iskardoh in Bulkistan, and by the aid of Rajah Ahmud Shah traced the Shiggur branch of the Indus to its source in the glacier on the southern flank of the Mooztagh range, now ascertained to be 28,200 feet above the level of the sea. Having examined the great glaciers of Arindoh and of the

Braldoh valley, he returned to Cashmeer by the Valley of Astore, where he discovered the Assafœtida plant of commerce, which he was the first to describe. On October 10th he reached Cashmeer, from which he set out again on the 22nd, on his return journey through the Punjab to Suharunpoor. During this second visit to Cashmeer and part of the journey through the Punjab he was again severely ill. It was during this return journey that he discoverd the Sewalik formation with the remains of Mastodon, &c., in the hills between the Punjab and Cashmeer. During his stay in Cashmeer, Dr. Falconer transmitted to the Botanic Gardens at Suharunpoor 650 grafted plants, comprising all the more valuable fruit-trees of Cashmeer, with plants of the Prangos Grass ; and on his arrival at Suharunpoor, early in December 1838, his collections in Botany, Zoology, and Geology amounted to nine cart-loads. Besides the plants yielding Assafœtida and *koost*, articles of considerable commercial value, they included numerous new species of plants, 587 sorts of seeds, 234 skins of birds, and 30 specimens of Mammalia, including one new species of *Cervus*, two of *Capra*, and one of *Moschus*—the details of which will be found in Dr. Falconer's official account of the expedition, and in the notes and appendices.[1]

In 1841, Dr. Falconer addressed a letter to the Secretary of the Asiatic Society on the then recent Cataclysm of the Indus, and while advocating a careful Government investigation of its causes, suggested as an explanation a temporary obstruction of the river with snow or ice above Iskardoh. This he supposed had dammed up the water and caused the river to be so low, that at Attock, in place of being as usually, many fathoms, it was fordable. All at once the obstacle had given way, and a mighty flood coming down had swept everything before it.[2]

In 1840, Dr. Falconer's health, shattered by previous attacks of severe tropical diseases—the results of incessant exposure—gave way ; and alarming symptoms setting in, he was compelled in 1842 to seek for recovery by returning to Europe on sick leave. He brought with him the Natural History collections amassed during ten years of exploration. They amounted to seventy large chests of dried plants from

[1] See vol. i. p. 557.
[2] Journ. As. Bengal, vol. x. p. 615. July 1841.

Cashmeer, Afghanistan, Tibet, the Punjab, the Himalayahs, the plains of the N.W. provinces, and from the neighbourhood of Darjeeling, Assam, and Sylhet; and forty-eight cases containing five tons of fossils bones, together with geological specimens, illustrative of the Himalayan formations from the Indus to the Gogra, and from the plains of the Punjab across the mountains north to the Mooztagh range.

From 1843 to 1847 Falconer remained in England. He occupied this time in publishing numerous memoirs on the geology and fossil remains of the Sewalik Hills, which appeared in the 'Transactions' of the Geological Society, and in the 'Proceedings' of the Zoological Society, of the British Association, and of the Royal Asiatic Society, and which have been reproduced in these his collected works. He had now an opportunity of comparing the Indian fossils with the metropolitan collections of Palæontology and Comparative Anatomy. On his arrival he was at first so weak that for several weeks he was unable to walk, but his first visits were to the Royal College of Surgeons and the British Museum; and he at once wrote off a glowing account of the treat which he had received to Captain Cautley, in India. He might well contrast the advantages enjoyed by the palæontological student in London with the difficulties which he and his colleague had so ably surmounted in India. He also communicated several important papers on Botanical subjects to the Linnean Society;[1] of which may be specially mentioned that on *Aucklandia Costus*, the Cashmeer plant which yields the *Kostos* of the ancients; and that on *Narthex Assafœtidæ*, which was the first determination of the plant, long contested among botanists, which yields the Assafœtida of commerce, and which he had found growing wild in the Valley of Astore, one of the affluents of the Indus. His extensive botanical collections, on which he had bestowed so much labour, were unfortunate. Having partially suffered from damp on the voyage to England, they were left deposited in the East India House during Falconer's second absence in India, and the specimens underwent a ruinous process of decay. Those which escaped were obtained in 1857 from the Court of Directors, by Dr. J. D. Hooker, for the Museum at

[1] See List of Botanical Memoirs at p. lv.

Kew. Respecting this collection, Dr. Hooker and Dr. Thomson thus wrote in the 'Flora Indica,' published in 1855 :—

'We cannot conclude this comprehensive catalogue without an allusion to the labours of Dr. Falconer, one of the most estimable, able, and accomplished of Indian botanists; to whose liberality and good offices we were in many ways indebted as travellers in India, and are still as workers at home. Dr. Falconer was one of the first botanists who visited Cashmeer and Little Tibet, where he formed magnificent collections, as he also did in Kumaon and the Punjab, illustrating his specimens with voluminous notes and details of their structure. His collections are, we believe, still in the India House, where they have been for many years. They constitute the only herbarium of importance to which we have failed to procure access, and we are hence unable to do our friend that justice in the body of this work to which, as the discoverer of many of the plants described, he is pre-eminently entitled.'[1] It may be added, that since his death Dr. Falconer's voluminous botanical notes, with 450 coloured drawings of Cashmeer and Indian plants, have been deposited in the Library at Kew.

But his main work during his residence at this time in England was the determination and illustration of the Indian fossils in the British Museum and in the East India House. Captain Cautley, in 1840, had presented his vast collection, the result of ten years' unremitting labour and great personal outlay, to the British Museum, the Geological Society having declined to accept it, as it was beyond their means of accommodation. Its extent and value may be estimated from the fact that it filled 214 large chests, the average weight of each of which amounted to 4 cwt., and that the charges on its transmission to England alone, which were defrayed by the Government of India, amounted to 602*l*. Dr. Falconer's selected collection was divided between the India House and the British Museum; the great mass was presented to the former, but a large number of unique or choice specimens required to fill blanks or improve series were presented to the latter.[2] Other collections of the

[1] 'Flora Indica.' By J. D. Hooker, M.D., and Thos. Thomson, M.D. Lond. 1855, pp. 67–8.

[2] All the specimens in the India House collection which were figured in the 'Fauna Antiqua Sivalensis' were subsequently removed to the British Museum.

Sewalik fossils had been presented to the Museum of the Edinburgh University by Colonel Colvin, and to the Oxford University by Mr. Walter Ewer. The bulk of the specimens in the British Museum were still unarranged and embedded in matrix. In July 1844, a memorial, signed by the Presidents of the various Scientific Societies,[1] was presented to the Court of Directors of the Hon. East India Company, pointing out the desirability of having the specimens in the National Collection prepared, arranged, and displayed, and also of publishing an illustrated work, which would 'convey to men of science in both hemispheres a knowledge of the contents of the Sewalik Hills,' and suggesting Dr. Falconer as the person most fitted to superintend the preparation and arrangement of the specimens and to edit the work. At the meeting of the British Association held at York in the following October, a committee, consisting of the President of the Association with the President of the Royal and Geological Societies, &c., was appointed to memorialize Her Majesty's Government with the same object. Sir Robert Peel, then at the head of the Government, responded to this appeal by making a grant of 1,000*l.* to prepare the materials in the British Museum for exhibition in the Palæontological Gallery. Falconer was in December, 1844, entrusted with the superintendence of the work, and rooms were temporarily assigned to him by the Trustees of the British Museum. The Court of Directors also of the East India Company liberally employed him on duty, on the footing of service in India; and at his instance they caused to be prepared a series of coloured casts of the most remarkable of the Sewalik fossil forms, sets of which were presented to the principal Museums of Great Britain and Europe.[2] Under the patronage of the Government and of the East India Company, each of which subscribed for forty copies, an illustrated work was also brought out, entitled 'Fauna Antiqua Sivalensis.' The work was to have appeared in twelve parts, and six years were calculated as the time necessary for its

[1] The Marquis of Northampton, President of the Royal Society; Lord Auckland, President of the Asiatic Society; Henry Warburton, Esq., M.P., President of the Geological Society; Mr. (now Sir Roderick) Murchison, President of the Geographical Society; Dr. Buckland, &c.

[2] The Museums were those of the Universities of Oxford, Cambridge, and Edinburgh; Trinity College, Dublin; the Royal College of Surgeons; Paris, St. Petersburgh, Copenhagen, Stockholm, Vienna, Berlin, Bonn, Munich, Florence, Rome, Leyden, Brussels, Calcutta, and Bombay.

completion; but within three years there appeared nine parts of the work, each containing twelve folio plates, executed in a style of lithography rarely, if ever, equalled. Mr. Ford, the artist to whom the work was so much indebted, bestowed in several instances as much as 180 hours upon a single plate. No fewer than 1,123 specimens are figured in these plates; and of many specimens three, four, or five different views are given. Besides the Sewalik fossils proper, the 'Fauna Antiqua' includes illustrations of a very valuable and important series of mammalian remains from the Pliocene deposits of the Valley of the Nerbudda, together with illustrations of the Miocene fauna of the Irrawaddi and of Perim Island in the Gulf of Cambay. The descriptive letter-press unfortunately did not keep pace with the plates. After a little progress, Dr. Falconer 'found that the labour in comparing and identifying the enormous mass of materials was so great and the references to be consulted so numerous, that, if he had given up his time to the letter-press, he would have been unable to finish the preparation and arrangement of the collection in the British Museum during the period within which his stay in England was, by the rules of the Indian service, peremptorily limited.' In December, 1847, he was compelled to return to India, where he found it impossible to continue the work, as he had hoped, at a distance from the specimens. On his return to England in 1855, many of the unpublished plates[1] had been erased from the stones on which they had been drawn, and many of the original subscribers were dead, so that the work could only have been continued under extraordinary difficulties. It was Dr. Falconer's intention, nevertheless, to have completed it, and in October 1856, he applied to the Trustees of the British Museum for accommodation and access to the specimens, to enable him to carry out this object. Bad health, however, which compelled him to seek a warmer climate, and his ambition to master every detail connected with the fossil mammalian fauna of Europe, before proceeding to generalize on that of the Sewalik Hills, caused him to postpone its execution until it was too late. To collect

[1] Proof copies of seventeen of these plates, together with outline tracings for the remaining plates of the work, have been deposited in the Library of the British Museum. (See vol. i. pp. 538, 554.)

and arrange the notes which he left behind has been the endeavour of the Editor of these volumes. The great Indian fossil collection, mainly the gift of Sir Proby Cautley, but the specimens of which, unique in their richness, stupendous size, and fine preservation, were prepared, identified, and arranged by Falconer, has long constituted one of the chief ornaments of the Palæontological Gallery of the British Museum. There it may be well said of Falconer and of Cautley: 'Si monumentum quæris, circumspice.'

In June 1847, on the retirement of the late Dr. Wallich, Dr. Falconer was appointed his successor as Superintendent of the Calcutta Botanic Garden, and Professor of Botany in the Medical College; but for six months, at a considerable pecuniary sacrifice, he continued to prosecute his work in connection with the 'Fauna Antiqua Sivalensis;' and it was not until December 20, when a longer delay would have 'involved the forfeiture of his commission and his right to a pension,' that he left England. In February, 1848, he entered upon his new duties in Calcutta, and became at once the referee and adviser of the Indian Government and of the Agricultural and Horticultural Society on all matters pertaining to the vegetable products of India. In 1850 he was deputed to the Tenasserim Provinces, to examine the Teak forests, which were threatened with exhaustion from reckless felling and neglected conservation. His report, suggesting remedial measures, was published in 1850 in the 'Selections from the Records of the Bengal Government,' and is a model of clearness and preciseness on the subject of which it treats.[1] In 1852 he published, in the 'Journal of the Agricultural and Horticultural Society of India,' a paper on the quinine-yielding Cinchonas and on their introduction into India; and in the following year the writer of this sketch saw in the Calcutta Botanic Garden a Wardian case containing specimens of *Cinchona Calisaya*, in which Falconer took great interest. Dr. Falconer was not at the time cognizant of Weddell's accurate determination of the species of Cinchona; but he recommended a trial of them in India, and indicated the hilly regions in Bengal and the Neilgherries in Southern India as the most promising situations for experimental

[1] See List of Botanical Memoirs and Reports, at page lvi, No. 17.

nurseries. The subject was taken up some years afterwards; the bark-yielding Cinchonas were then introduced from South America, and they are now thriving and promise to be a new source of wealth to India. From what has been stated, it will be seen that Falconer was not only instrumental in rescuing from destruction the Teak forests of Tenasserim, but in introducing the cultivation of Tea and Cinchona Bark into our Indian Empire. During his residence in Calcutta, Dr. Falconer communicated to the Agricultural and Horticultural Society many botanical and other reports of great economic value, among which may be mentioned those on 'The Woods for Railway Sleepers in India,' on 'The Timber Trees used for Fuel,' on 'The best means of Tapping the Caoutchouc Tree of Assam,'[1] and on 'The Wild Cochineal insect of Assam.'[2] He was likewise employed in the selection and arrangement of the illustrations of the Botanical products of Bengal forwarded to the Great Exhibition of 1851; and he was the author of the Report on Cashmeer Shawls which appeared in the Official Catalogue.[3] In 1854, assisted by his friend the late Mr. Henry Walker, Professor of Physiology in the Medical College of Calcutta, he undertook a descriptive catalogue of the fossil collections in the Museum of the Asiatic Society of Bengal, which was published as a distinct work in 1859.[4] The labour which this involved was immense. No separate record had been kept by the Society of the numerous presentations of fossils which had been made to it from time to time, and the specimens from different localities were mixed up in the most hopeless confusion. Fossil bones from the Lias of England, from the Cape of Good Hope, Ava, Perim Island, the Valley of the Nerbudda, and the Sewalik Hills were huddled together in heaps in various rooms, and in ninety-nine cases out of a hundred without a label or mark of any kind to indicate whence they came. Dr. Falconer's familiarity with the characters of the fossils from different sources in India enabled him to convert what was little more

[1] See List of Botanical Memoirs and Reports at page lvi.

[2] Journ. Agr. Hort. Soc. of India, vol. vii. p. 33.

[3] Offic. Descript. and Illust. Cat., vol. ii. p. 934.

[4] Descriptive Catalogue of the Fossil Remains of Vertebrata from the Sewalik Hills, &c., in the Museum of the Asiatic Society of Bengal. Calcutta 1859. 8vo. p. 261.

than a chaotic heap of rubbish into a collection of fossils accurately identified and worthy of the Capital of India. In this work he pointed out the distinguishing characters of the matrix of the fossils from different parts of India, as follows:—

1. Those from Ava are black and heavy, and often strongly impregnated with hydrate of iron.

2. Those from Perim Island are usually embedded in a yellow marly conglomerate.

3. The matrix of the Nerbudda specimens is white, soft, friable, and adhering to the tongue, without any ferruginous or calcareous infiltration.

4. The majority of the Sewalik fossils are embedded in a hard sandstone matrix, but others are black, heavy, impregnated with iron, and scarcely distinguishable from the Ava specimens.[1]

As a teacher of botany in the Medical College, Falconer was eminently successful and always a great favourite with his pupils. His house in Garden Reach will long be remembered for the hospitality dispensed to the many who were reckoned among his friends, and particularly to young officers on their first arrival in India. In the spring of 1855 he retired from the Indian service, and on his return home he visited the Holy Land, whence he proceeded along the Syrian coast to Smyrna, Constantinople, and the Crimea, during the siege of Sebastopol.

On his arrival in England he at once resumed his palæontological researches, and in 1856 he published an essay to vindicate the principle propounded by Cuvier, that the laws of correlation which preside over the organization of animals is the guide to the reconstruction of extinct forms.[2] His time was now mainly occupied in studying the fossil species of Mastodon, Elephant, Rhinoceros, and other Mammalia,

[1] The writer has received the following note from Sir Proby Cautley on a fossiliferous stratum lying below the great sandstone and shingle deposits of the Sewaliks:—'The Kalowala Pass deposit of clay-marl in which the small black (hydrate of iron) fossils were found in such numbers by me, and which Durand also found north (or on the Himalayah side) of Nahun is a totally different one from that in which the larger fossils were found in the upper sandstone strata, and lying on the surface amongst the detritus of the sand rocks.'

[2] On Professor Huxley's attempted refutation of Cuvier's Laws of Correlation in the reconstruction of Extinct Vertebrate forms.—'Annals and Magazine of Nat. Hist.,' June 1856.

and the Cave fauna of England and of the Continent. With this object he visited and examined for himself almost every museum and private collection of any note not only in England, but in France, Italy, and Germany, and took careful and detailed notes upon the spot of all the more important specimens. The winters and spring of 1858, 1859, and 1860–61, which he was obliged to spend in the south of Europe on account of his health, were devoted to a study of the valuable collections in the Museums of Lyons, Montpellier, Italy and Sicily; and in the autumn of 1863, in company with his friend M. Lartet, he visited the various collections of fossil remains of Rhinoceros and Cervus in Chartres and Puy-en-Velay. In 1857 he communicated to the Geological Society two memoirs 'On the Species of Mastodon and Elephant occurring in the fossil state in England.'[1] In these essays he attempted to discriminate with precision the Mastodon of the Crag (*M. Arvernensis*) from *M. longirostris* and *M. angustidens*; and to prove that three British fossil Elephants, *E. primigenius*, *E. antiquus*, and *E. meridionalis*, had till then been confounded under the name of *E. primigenius*. So far as materials were available he showed the range of existence geographically and in time of each of these species, and the mammalian fauna with which each was associated. He likewise produced a synoptical table showing the serial affinities of all the species of the Proboscidea, fossil and living, then known, of the former of which a large number had been either discovered or determined by himself. In 1845, at the meeting of the British Association at Cambridge, Dr. Falconer had endeavoured to prove by specimens of crania and teeth, that there was a continuous passage between the Mastodons and Elephants, the forms included by Clift under *M. Elephantoïdes* constituting the connecting links. This view was further developed in the published plates of the 'Fauna Antiqua Sivalensis' and in the two memoirs just referred to. He was the first to establish the constancy of the Ternary and Quaternary ridge-formulæ in the Mastodons, as a means of ranging all the known species under the two natural groups of *Trilophodon* and *Tetralophodon*; and he extended the same principle of

[1] See vol. ii. pp. 1, 76.

the ridge-formula to the arrangement of the rest of the Proboscidean forms, or Elephants, under the divisions of *Stegodon*, *Loxodon*, and *Euelephas*. In 1858 he urged upon the Palæontographical Society the propriety of 'bringing out a series of figures of the natural size and with descriptions of all the teeth of each species of fossil Elephant and Mastodon found in the British strata, so that, wherever a specimen might be discovered, there might be a standard figure by which any competent observer might be able at once to identify it.'[1] In 1862 Dr. Falconer communicated to the British Association at Cambridge an account of *Elephas Melitensis*, the pigmy fossil Elephant of Malta, discovered with other extinct animals by his friend Capt. Spratt, C.B., in the ossiferous cave of Zebbug. This unexpected form presented the Proboscidea in a new form to naturalists.[2] Further researches on general questions concerning the same family appeared in a memoir on *Elephas Columbi*, published in the 'Natural History Review' for 1863, the title of which but inadequately indicated the range of the subjects discussed.[3]

His researches on the fossil species of *Rhinoceros* were scarcely less important. Among many notes and papers which never appeared during his lifetime may be mentioned a most important memoir 'On the European Pliocene and Post-Pliocene Species of Rhinoceros.'[4] In this memoir it is attempted to be shown that there are four distinct Pliocene and Post-Pliocene species of Rhinoceros, three of which have long been confounded by Cuvier and other Palæontologists under the name of *R. leptorhinus*. One of these, the original *R. leptorhinus* of Cuvier, founded upon the Cortesi cranium (*R. megarhinus*, Christol), has no bony nasal septum; two, *R. Etruscus*, Falc., and *R. hemitœchus*, Falc. (*R. leptorhinus*, Owen), have a partial bony septum; while the fourth, *R. antiquitatis*, Blumb., or *R. tichorhinus*, Fisch. and Cuv., has the bony septum complete.

Soon after his return to England Dr. Falconer devoted much study to the new Purbeck mammalian genera discovered by Mr. Beckles, near Swanage. The specimens were

[1] Letter to J. Bowerbank, Esq., Sec. Pal. Soc., March 23, 1858.
[2] See vol. ii. p. 292.
[3] See vol. ii. p. 212.
[4] See vol. ii. p. 309.

subsequently transferred to Mr. Owen for description; but, in 1857, Dr. Falconer published an account of one of these remarkable Purbeck genera, Plagiaulax, and this was followed, in 1862, by a second paper on the disputed affinities of the genus.[1]

Having occupied himself during several years with the special investigation of the Mammalian fauna of the Pliocene, as distinguished from that of the Quaternary period of Europe, he was conducted to the examination of the Cave fauna of England. In 1860 he communicated a memoir to the Geological Society on the Ossiferous Caves of Gower explored or discovered by his friend Colonel Wood, of Stout Hall.[2] The existence of *Elephas antiquus* and *Rhinoceros hemitœchus* as members of the Cave fauna was then for the first time established, and the age of that fauna precisely defined as posterior to the Boulder-clay, or period of the Glacial submergence in England. At the time of his death he was busily engaged in collecting materials for memoirs on the fossil remains of *Cervus*, *Hyœna*, *Spermophilus*, and other genera.[3]

In 1860, while on a visit to Torquay, he was induced to examine the vegetable fossils of the Bovey Tracey Coal, for which he was prepared by previous researches on the vegetable fossils of the Burdwan Coal in India,[4] and he was led to the conclusion that the Bovey Coal, which for twenty years had vibrated in the minds of geologists between Eocene and Post-Pliocene, belonged really to the Miocene and was in correlation with the Coal formations of Germany and Switzerland.[5] This opinion was confirmed by the more detailed investigations of Professor Heer, the results of which were embodied in a memoir presented to the Royal Society in 1862.

While exploring the Himalayahs in his early days, Falconer's attention had been closely directed to the physical features which distinguished them from mountain ranges in temperate regions, and more especially to the general absence from their southern valleys of the great lakes so common in corresponding situations in the Alps. When the hypothesis

[1] See vol. ii. pp. 408, 430.
[2] See vol. ii. p. 498.
[3] See vol. ii. pp 452 to 481.
[4] See List of Botanical Memoirs and Reports at page lv, No. 2.
[5] Letter to His Grace the Duke of Argyll, April, 1860.

of the excavations of lake-basins by glacial action was brought forward, he took a share in the discussion, and combated the view by an appeal to the contradictory evidence furnished by the Himalayahs, the lakes of Lombardy, and the Dead Sea. In connection with this subject it may be mentioned that his last public act—the last occasion in fact in which he left his house—was to attend the Council meeting of the Royal Society, with the object of advocating the grant of 100*l.* to Sir Henry James, for accurately determining by levelling the amount of depression of the Dead Sea below the level of the Mediterranean, an object which since Dr. Falconer's death has been accomplished.[1]

In 1861 Dr. Falconer gave important evidence before the Royal Commission appointed to inquire into the sanitary condition of India. He distinguished between the removable and the irremovable causes of disease, and under the latter he ranked excessive heat and excessive moisture as telling most on the health. He expressed the opinion that fever often resulted from malaria produced by vegetable decomposition.

For nearly thirty years Dr. Falconer had been engaged more or less with the investigation of a subject which has lately occupied much of the attention both of men of science and of the educated classes generally, viz. the proofs of the remote antiquity of the human race. In 1833, fossil bones procured from a great depth in the ancient alluvium of the Valley of the Ganges in Hindostan were erroneously figured and published as human. The subject attracted much attention at the time in India. It was in 1835, while the interest was still fresh, that Dr. Falconer and Captain Cautley discovered the remains of the gigantic Miocene fossil Tortoise of India, which by its colossal size realized the mythological conception of the Tortoise which sustained the Elephant and the World together on its back.[2] In the same formations as the *Colossochelys* the remains were discovered of a smaller Tortoise, identical with the existing *Emys tecta*. About the same time also several species of fossil *Quadrumana* were discovered in the Sewalik Hills, one of which was thought to have exceeded the Orang-Outang, while another was hardly

[1] See vol. ii. p. 655.

[2] See vol. i. p. 367.

distinguishable from the living 'Hoonuman' Monkey of the Hindoos. Coupling these facts with the occurrence of the camel, giraffe, horse, crocodiles, &c., in the Sewalik fauna, and with the further important fact that the plains of the Valley of the Ganges had undergone no late submergence, and passed through no stage of glacial refrigeration, to interrupt the previous tranquil order of physical conditions, Dr. Falconer was so impressed with the conviction that the human race might have been early inhabitants of India, that he was constantly on the look out for the upturning of the relics of man or of his works, from the Miocene strata of the Sewalik Hills. In April 1844 he wrote thus to his friend Captain Cautley :— 'Joining the indication given by the Hindoo mythology with the determined fact of the little *Emys tecta* having survived from the Fossil period down to the present day, I have put forward the opinion that the large Tortoise may have survived also, and only become extinct within the human period. *This is a most important matter in reference to the history of man.*' The same view was publicly announced in 1844 at the Zoological Society.[1] In the account of the gigantic fossil Tortoise, which appeared in the joint names of Dr. Falconer and Captain Cautley, the palæontological and mythological bearings of the case are summed up as follows: 'The result at which we have arrived is, that there are fair grounds for entertaining the belief that the *Colossochelys Atlas* may have lived down to an early epoch of the human period and become extinct since.' Ten years later, while investigating the fossil remains of the Jumna, he pointed out that they were 'most promising of results bearing upon the human period.'[2]

In May, 1858, having the same inquiry in view, while occupied with his Cave researches, he communicated a letter to the Council of the Geological Society, which suggested and led to the exploration of the Brixham Cave, and the discovery in it of flint-implements of great antiquity associated with the bones of extinct animals. In conjunction with Professor Ramsay and Mr. Pengelly he drew up a report on the subject, which, communicated in September of the same year to the Councils of the Royal and Geological Societies, excited the interest of

[1] See vol. i. p. 366.

[2] Preface to descriptive Cat. of Fossils in the Museum of the Asiatic Society of Bengal, 1855, p. 7.

men of science in the case.[1] Although, 'loath in the last degree to leave England, having so much unfinished work on hand,' his health compelled him to seek a warmer climate for the winter. He followed up, however, the same object by proceeding to Sicily to examine the ossiferous caves of that island, and he there discovered the 'Grotta di Maccagnone,' in which flint-implements of great antiquity were found adhering to the roof-matrix, mingled with remains of hyænas now extinct in Europe. An account of this important cave was communicated to the Geological Society.[2] Having examined the collection of M. Boucher de Perthes, on his route to Sicily, he was impressed with the authenticity of some of the flint-implements discovered in the Valley of the Somme, and he urged his friend Mr. Prestwich, than whom there is no higher authority in this branch of Geology, to proceed there and investigate the conditions of the case. This led to Mr. Prestwich's celebrated memoir on the flint-yielding Quaternary deposits of the Somme. Thus, in 1859, the subject of the antiquity of the human race, which had previously been generally discredited by men of science, was launched upon fresh evidence. Since then it has been actively followed up by numerous inquirers, and Dr. Falconer himself was contemplating, and had indeed actually commenced, a work 'On Primeval Man.'[3] In 1863 he took an active share in the singularly perplexed discussion concerning the human jaw of Moulin-Quignon; and in the Conference of English and French men of science held in France he expressed doubts as to the authenticity of the specimen, but in that guarded and cautious manner which was characteristic of him. Dr. Falconer's honesty of purpose and love of truth were well exemplified in this controversy. Before proceeding to the Conference he had publicly expressed an opinion unfavourable to the authenticity of the jaw. The results of the first few days of the Conference seemed to be in his favour, and he wrote thus to London: 'I have every confidence from the present aspect of the matter that we shall establish our case. But I am open to conviction, and will give a true and honest verdict to the best of my convictions.' At the close of the Conference, he wrote again in these words: 'In the

[1] See vol. ii. p. 491.
[2] Ib. p. 543.
[3] Ib. p. 570.

long run matters went against us; and I am very glad that they did, as truth alone was our object.' The doubts which he still entertained were set forth in a memoir which he subsequently wrote, but which never appeared in his life-time.[1]

In the spring of 1864 he published a notice on the remarkable works of art by 'primeval man,' discovered by Messrs. Lartet and Henry Christy in the ossiferous caves of the Dordogne,[2] which he had visited himself in conjunction with M. Lartet; during the subsequent summer he was occupied in preparing a memoir 'On the Asserted Occurrence of Human Bones in the Ancient Fluviatile Deposits of the Nile and Ganges, with Comparative Remarks on the Alluvial Formation of the two Valleys';[3] and in September he accompanied his friend Mr. Busk to Gibraltar, to examine caves in which marvellously well-preserved remains of man and mammals of great antiquity had been discovered. Before starting, he drew up, in conjunction with Mr. Busk, a preliminary report on the specimens brought from Gibraltar to this country, which was presented to the meeting of the British Association at Bath. He attached great importance to the results of this expedition; and on his return home he continued to prosecute the examination of the fossil remains of Gibraltar, the results of which he contemplated elaborating, in conjunction with those of his explorations in Sicily, into a separate memoir on the Mediterranean Cave Fauna.[4]

But his labours were at an end. From Gibraltar he hastened home to support at the Council of the Royal Society the claims of Charles Darwin for the Copley Medal. He suffered much from exposure and fatigue, consequent on the breaking down of the diligence on the Sierra Morena, on his return journey through Spain from Gibraltar, so that the inclement winter told with additional force upon a constitution naturally susceptible of cold and weakened by long residence and serious diseases in India. On January 19th, on his return from a meeting of the Council of the Royal Society, he felt depressed and feverish. The attack speedily became

[1] See vol. ii. p. 601.
[2] Ib. p. 626.
[3] Ib. p. 632.
[4] Since Dr. Falconer's death, a preliminary report on the Gibraltar Caves, drawn up by Dr. Falconer and Mr. Busk, as a letter to Sir W. Codrington, the Governor of Gibraltar, has been published in the Quart. Journ. Geol. Soc., (see vol. ii. p. 554.) A more detailed report by Mr. Busk may shortly be expected.

developed into acute rheumatism, complicated with disease of the heart and lungs, which proved fatal on the morning of January 31, 1865. On February 4 his remains were committed to their last resting-place, at Kensal Green, in the presence of a large number of his sorrowing friends and fellow-labourers.

At the time of his death Dr. Falconer was a Vice-President of the Royal Society and Foreign Secretary of the Geological Society. He had been elected a Fellow of the Royal Society in 1845, and in the same year he had been offered the Secretaryship of the Geological Society, which he had been obliged to decline, as his time was fully occupied with the Sewalik collection in the British Museum. Foreign countries had not failed to acknowledge his transcendent merits as a Naturalist. Besides being a Fellow of the Royal, Linnean, Geological, Zoological and Horticultural Societies at home, and a Member of the Asiatic Society of Bengal, he had been elected a Corresponding Member of the Academy of Natural Sciences of Philadelphia (1836), Foreign Member of the Imperial Austrian Society of Agriculture (1840), Corresponding Member of the National Institute of Washington (1840), Corresponding Member of the Royal Academy of Sciences of Turin (1844), Hon. Member of the Natural History Society of Hesse Darmstadt (1846), Hon. Member of the Academia Valdarnese del Poggio (1859), Corresponding Member of the Imperial Society of Emulation of Abbeville (1863), Corresponding Member of the Imperial and Royal Geological Society of Vienna (1863), and Corresponding Member of the Academy of Natural Sciences of Italy (1863).

As an additional proof of the high esteem in which he was held by men of Science, it may be mentioned that, at a meeting held in London on February 25th, 1865, Sir Proby T. Cautley, K.C.B., in the Chair, it was resolved 'to record the great loss sustained by Science in the early death of the late Dr. Falconer, and to perpetuate his name as a naturalist and a scholar by a suitable memorial.'

It was also resolved that this memorial should include a marble bust, to be placed in the rooms of one of the Scientific Societies, or elsewhere, in London, as might be determined.

One of the objects in which Dr. Falconer had taken deep

interest, up to the latest hour of his life, having been the foundation of Fellowships or Scholarships in the University of Edinburgh, to enable deserving students to prolong their studies beyond the usual academical period, it was further resolved to collect funds for the purpose of founding, in that University, a Fellowship or Scholarship in Natural Science, tenable for a limited term of years, and to be called 'The Falconer Fellowship' or 'Scholarship.'

A Committee, including the Presidents of the Royal, Linnean, Geological, Geographical and Ethnological Societies, was at once formed to promote the objects of the 'Falconer Memorial,' by the exertions of which a sum of nearly 2,000*l.* was collected. The marble bust, by Mr. Timothy Butler, has been accepted by the Royal Society, and placed in their rooms; and by a separate subscription another marble bust has been placed at Calcutta in the Museum of the Asiatic Society of Bengal, to the early reputation of which Falconer so materially contributed. Before long the 'Falconer Fellowship' will be founded in the University of Edinburgh, and will be the real monument of the genius of the man whose name it bears.

From what has been said, it is obvious that Falconer did enough during his lifetime to render his name as a palæontologist immortal in Science; but the work which he published was only a fraction of what he accomplished. The amount of scientific knowledge that perished with him was very great; for not only did he die in the prime of life and in the fulness of his power, but he was cautious to a fault; he always feared to commit himself to an opinion until he was sure that he was right; and thus, as too often happens under such circumstances, he constantly deferred publishing his views, and others reaped the credit of observations originally made by him. No scientific man was ever more deeply imbued with the sentiment, so eloquently expressed by Cicero in the following passage, than he.

'Quid est enim temeritate turpius? aut quid tam temerarium tamque indignum sapientis gravitate atque constantia, quam aut falsum sentire, aut, quod non satis explorate perceptum sit et cognitum, sine ulla dubitatione defendere?' (*Cic. de Nat. Deor.* lib. i.)

These volumes, however, will suffice to rescue his name

from any charge of idleness which some, in ignorance, may have attributed to him.

The rapturous enthusiasm with which Falconer prosecuted his favourite researches, as well as the inferences he drew from the teachings of geological science, are made evident by the following extracts from his Note-books and correspondence.

Writing in 1840 of his Sewalik discoveries, he says:—

'What a glorious privilege it would be, could we live back—were it but for an instant—into those ancient times when these extinct animals peopled the earth! To see them all congregated together in one grand natural menagerie—these Mastodons and Elephants, so numerous in species, toiling their ponderous forms and trumpeting their march in countless herds through the swamps and reedy forests: to view the giant Sivatherium, armed in front with four horns, spurning the timidity of his race, and, ruminant though he be, proud in his strength and bellowing his sturdy career in defiance of all aggression. And then the graceful Giraffes, flitting their shadowy forms like spectres through the trees, mixed with troops of large as well as pigmy horses, and camels, antelopes, and deer. And then last of all, by way of contrast, to contemplate this colossus of the Tortoise race, heaving his unwieldly frame and stamping his toilsome march along the plains which hardly look over strong to sustain him.

'Assuredly, it would be a heart-stirring sight to behold! But although we may not actually enjoy the effect of the living pageant, a still higher order of privilege is vouchsafed to us. We have only to light the torch of philosophy, to seize the clue of induction, and like the prophet Ezekiel in the vision, to proceed into the valley of death, when the graves open before us and render forth their contents; the dry and fragmented bones run together, each bone to his bone; the sinews are laid over, the flesh is brought on, the skin covers all, and the past existence—*to the mind's eye*—starts again into being, decked out in all the lineaments of life. "He who calls that which hath vanished back again into being enjoys a bliss like that of creating." Such were the words of the philosophical Niebuhr, when attempting to fill up the blanks in the fragmentary records of the ancient Romans, whose period in relation to past time dates but as of yesterday. How much more highly privileged then are we, who can recall as it were the beings of countless remote ages, when man was not yet dreamt of; not only this, but if we use discreetly the lights which have been given to us, we may invoke the spirit of the winds, and learn how *they* were tempered to suit the natures of these extinct beings. We may contemplate the soil on which they were afterwards to move and breathe, at first reposing under the depths of the ocean, and then raised tranquilly

into the air, or disrupted by measureless forces, and projected in mountain-ranges high into the heavens. All this may we see, and even date the various events with nearly as much certainty in regard to past time, as we now do human occurrences which refer to the period of the Olympiads. For the Almighty Creator, infinitely beneficent in regard to the wants of his creatures, and thrifty in the use of means, has left imperishable monuments and inscriptions of the past operation of his laws, more durable than the pyramids, and more legible than the hieroglyphics of the Egyptian porphyries. He has engraved on our natures, as well as in the record of revelation, "Seek, and ye shall find; knock, and it shall be opened unto you." In the exercise of this high endowment of our nature, we glorify in the highest degree the attributes of our Creator; and who is he that shall dare to say such pursuits are unholy or opposed to the ends of man's being? That person, if such there be, is an anachronism in time, and a traitor to his being. Better that he should never have been, or that he should have lived amidst the darkness of the middle ages, than that he should deck himself out in the pride of ignorance, as in a marriage garment, and mislead the helpless prejudices of the unlearned. Truly that man arraigns the wisdom and beneficence of God, and vilifies the dignity of his own nature.'

Again, in 1854, he wrote thus to a relative :—

'It has never yet been pretended that there has been a divine revelation expounding the knowledge of the natural world. The Almighty has given us reason, and left us, by the adequate exercise of that power, to investigate the laws and order of Creation. Take Astronomy, and see what has been done in it. Is there any educated person now living that believes "that the sun was made to rule by day, and the moon by night," as servile attendants on the earth?—No; not one. Does any one now believe that the sun rolls round the earth?—No. Yet in former times the universal belief of mankind at the present day was denounced as a damning heresy, opposed to the Bible. Geology is now passing through the ordeal that Astronomy did in the days of Galileo. When the ignorant and bigoted fail in reason and argument, they raise the yell of intolerance, and charge the science with infidelity. The odium of the term serves their end for a time, but what follows? This denounced infidel doctrine, after the lapse of a few years, becomes the accepted faith of all mankind, philosophical and religious. When, therefore, in a good cause the imputation of infidelity is raised, one need not be ashamed of it. There can be no two truths in Nature opposed to each other. True religion and true science can never be irreconcileable. As regards the creation of the world, the evidence is as clear that millions and millions of years must have elapsed between the first appearance of life on the earth and the present day, as that

you and I possess eyes and ears, and have a living existence. The difference merely is, that the evidence is not of the same nature. The one is complete; the other fragmentary, but equally significant and strong. For instance, a tooth, or the end of a joint found in a rock, is as conclusive evidence of the former existence of an animal, as if all the structure—skin, flesh, blood, and living limbs—were before us. The only difference is, that in the one case the evidence is cumulative and complete in every detail; while in the other it is fragmentary and inductive; but it is equally clear and conclusive in both. For the Almighty has so ordained that reason can safely reproduce all that has been lost, and restore to the tooth all that was correlative to it in life. But, remember that what I have said here bears solely upon our knowledge of the physical world, and not to doctrines of faith for our moral and religious guidance.'

Lovers of science and they who knew Falconer well can best appreciate his penetrating and discriminating judgment, his originality of observation and depth of thought, his extraordinary memory, his fearlessness of opposition when truth was to be evolved, the scrupulous care with which he awarded to every man his due, and his honest and powerful advocacy of that cause which his strong intellect led him to adopt. They have also occasion to deplore the death of a staid adviser, a genial companion, and a hearty friend.

LONDON: PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
AND PARLIAMENT STREET